THE METRIC FALLACY.

TO THE EDITOR OF SCIENCE: Evidently Mr. Samuel S. Dale, in the issue of SCIENCE of March 3, 1905, under the above title, failed to recognize his own mathematical proof of the amount of saving in time that might accrue in school with the use of the decimal system.

His error probably arose through the use of an artificial week by the board of education merely for their own convenience in assigning the proportion of time in school for each study. The time a child actually spends in school is a small part of the year and it would be a confusion of units to compare this schedule week with a regular week because the same word is used.

The only way a comparison can rightly be made is to take Mr. Dale's statement of what the schedule week is in years—that is, for elementary mathematics thirty-four and one eighth schedule weeks require eight years' work. On this basis 6.825 schedule weeks will require one and three fifth years' work in mathematics.

It is, however, not necessary to introduce this schedule week. The pupil actually spends eight years, according to Mr. Dale, on the text-books mentioned. As arithmetic during all this time is a major study, it is taught to the full capacity of the average child. Now if twenty per cent. of this time, as is allowed by Mr. Dale, is spent on tables of weights and measures, evidently these will require all the time available for mathematics during 1.6 years.

It is probable that a child could easily learn the decimal system in less than half the time it takes to learn both the decimal system and the several other unconnected tables. Accepting Mr. Dale's own figures, it seems, therefore, reasonable to suppose that the average pupil would save from two thirds of a year to one year of the one and three fifth years, now required, and would be about a year ahead in mathematics at the end of the eight years if he had only the decimal system to learn.

I do not desire to enter upon any discussion as to the merits of the metric system, but simply to point out the mathematical error in Mr. Dale's reasoning and to show that if his argument was worth anything at all, it really proved the very statement he was trying to refute.

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March 9, 1905.

A REQUEST FOR MATERIAL.

I HAVE been at work for some time upon the problem of double monsters among animals and would be grateful for any material coming under this head. I wish instances of genuine double monsters, *i. e.*, those involving the doubling of some axial part of any vertebrate, embryonic or adult (naturally, not too large specimens), and am just now especially desirous of cases among birds. As this is the time of year at which embryological laboratories run their incubators, it seems likely that several such instances will be found by those not especially interested in the subject and who do not care to investigate them. If any such material appears superfluous I will try to make good use of it.

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SPECIAL ARTICLES.

ELLIPTICAL HUMAN ERYTHROCYTES. (A SUPPLEMENTARY STATEMENT.)

ON March 18, 1904, I published in SCIENCE a note describing an unusual variation in the shape of human erythrocytes. As was stated in that article, the blood of a student at the Ohio State University contained elliptical red corpuscles, whose average length was 10.3 microns and whose average width was 4.1 microns. About 90 per cent. were thus deformed. The observation attracted considerable attention, Professor Austin Flint being one among several who wrote to me for a specimen of the blood. There resulted some correspondence between Professor Flint and myself, and in a letter to him I remarked that some time after my observations had been made the young man having these elliptical corpuscles had died. Since the claim had been made that the young man (a mulatto)

was healthy when these corpuscles were discovered, the statement about his death naturally aroused some suspicion. Professor Flint wrote a note in Science, May 20, 1904, discussing the matter of form changes in the erythrocytes, and pointing out that in progressive pernicious anemia, and other blood diseases, the variations in form and size are well-known facts. He adds: 'In view of these facts, it seems impossible to accept the proposition that the subject of the observation was a *healthy* mulatto.'

It has been my intention to supply the information about the death of the subject of this observation, but for various reasons it has not been possible to do this with certainty until the present time. I am now able to state that the cause of death was cardiac failure subsequent to an attack of acute inflammatory rheumatism. As is often the case, the attack was preceded by tonsilitis, which began about three months after my observation had been made. Consequently, there was no connection between the condition of the corpuscles and the cause of death.

I wish to add some further points to substantiate my claim that the subject of the observation was healthy at the time the corpuscles were described. In the first place, his general physical condition indicated it. He was able to make his living by manual labor, and was studying hard to maintain his standing in his classes. He complained of no illness. As to his blood, it is to be noted that I said that the number of red and white corpuscles was normal, and that the quantity of hæmoglobin was normal. There were no normoblasts nor megaloblasts. On the other hand, when the corpuscles were observed in the fresh state, the uniformity of the elliptical shape was the remarkable feature. The poikilocytosis, to which Professor Flint refers, was much more prominent in the dried specimens. Now it is a well-known fact that there are no cells more susceptible to influences than the blood corpuscles, and, therefore, the poikilocytosis shown in my dried specimens can not be given much weight.

Speaking further about the form variation of red corpuscles, I would say that it is a question about which opinions differ considerably. However, it is not my intention to discuss that point further than to make a few statements bearing upon this particular case. Professor Flint quotes from Ewing's 'Pathology of the Blood,' p. 256, as follows: 'Some times in non-infectious purpura hemorrhagica the red corpuscles are undersized and many are oval.'

I may say in this connection that Professor Ewing saw a specimen of this blood of which I write, and he was of the opinion that the anomaly was one of congenital or developmental origin. He based his view in the first place upon the fact that the number of corpuscles and quantity of hæmoglobin were normal, and in the second place upon the general condition of the individual himself. The subject certainly did not have purpura. And further, I may add that while in Germany recently I had an opportunity to show the same specimen to several men, among them being Ehrlich. The opinions of these men differed somewhat, but in only one instance did doubt arise as to the health of the subject. With this one exception (and the man was not a pathologist, by the way), the specimen did not suggest pernicious anemia nor purpura. Dr. Arneth, in Würzburg, a man who has made several thousand blood slides from a great variety of clinical cases, had not seen such a specimen. One pathologist of considerable reputation thought that the shape was an artifact. He was doubtless influenced by the work of Weidenreich, who claims that the mammalian erythrocyte is not normally biconcave, but bell-shaped. Weidenreich attributes the biconcavity to the corpuscle's extreme 'Empfindlichkeit,' by virtue of which, with slight increase in the density of the plasma or other fluid, the biconcavity arises by loss of water from the corpuscles.* If his work be confirmed by later investigations it would have an important bearing, not only upon this variation which I report, but upon all clinical observations of form changes in the red cells. I do not think that the variation I have described was an artifact, however, and my

* Weidenreich, *Arch. f. Mik. Anat. u. Entwick.*, 1903, p. 459.

opinion is strengthened by that of Ehrlich, who, on the ground of the uniformity of the elliptical shape, concluded that it had been preformed in the individual. As to the cause of the anomaly, Ehrlich did not commit himself. In conclusion, I wish to state the following views about the case:

1. The variation recorded occurred in a healthy individual. His good general physical condition, the normal number of red and white cells, the normal quantity of hæmoglobin, and the absence of megaloblasts, megalocytes and normoblasts, preclude the idea of any known blood disease being connected with the phenomenon.

2. The anomaly was probably one of congenital or developmental origin. Ewing holds this view for reasons stated above. It is unfortunate that no family history could be obtained to throw light upon this point, except that a brother of the subject had normal corpuscles.

3. In the light of Weidenreich's work, it is possible that the elliptical shape was an artifact. Ehrlich and others, including Professor Bleile and myself, do not hold this view. It would be strange that such a remarkable variation would occur so uniformly over so long a period. (As was stated in the former article, my observations extended over a period of four months, and the corpuscles were discovered two months before a systematic study was begun.)

4. It is possible that this variation was antecedent to the onset of pernicious anemia or some other blood disease. That would make the deformity none the less remarkable, for there were absolutely no symptoms, at any time, of any incipient illness.

5. So far as the writer has been able to ascertain, this is the first case of the kind recorded. However, Ewald, of Strassburg, writes that he thinks a similar observation was made at Königsberg twenty or thirty years ago. I have not been able to find any written record of such an observation.

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QUOTATIONS.

COMPULSORY GREEK AT CAMBRIDGE.

THE University of Cambridge has declined, by a considerable majority, to make Greek an optional, instead of, as at present, a compulsory, subject in the previous examination. The decision was not unexpected; and probably now the whole question will enter on a new phase. Though sympathizing with the aims of the proposers of the graces, we have already expressed the opinion that it was perhaps a mistake to raise so great a question as the place of Greek in higher education upon the comparatively minor issue of the regulations for a pass examination, in which all that has to be considered is a *minimum* of attainment. This, as Professor Butcher has pointed out, is not the way to estimate the value to the community of any branch of academic learning, be it Greek, mathematics or science. But in the present examination-ridden condition of higher education in England our educational authorities seem unable to think of learning or study except in terms of examination, with the result that, in Professor Butcher's words, when it is desired to modify the existing relation of Greek to university studies, 'a single examination is tinkered, without any regard to its bearings on the university course as a whole.' There has been very little attempt to lay down definite lines of study, and then consider the preliminary examination at entrance in its relation to different curricula. Because the exaction of a *minimum* attainment in Greek is now found to press hardly upon certain students without any corresponding advantage of literary culture, it was proposed at Cambridge to give an unrestricted option to all candidates, with no distinction between students of literature and of science, of different lines of study and of different curricula. The more limited proposal rejected a short time ago by the University of Oxford at least recognized the principle of adjusting the entrance examination to certain lines of academic study; but it was too limited and partial in its scope, and its adoption would have gone but a very little way towards a solution of the problem. What is wanted now in the interests of higher